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INTERNATIONAL BULLETIN
OF PLANT PROTECTION

1945 Nos. 9 & 10

CONTRIBUTION TO THE BIOLOGY OF THE OLIVE GALL GNAT (*PROLASIOPTERA BERLESIANA* PAOLI) IN ITALY*

The adults of *Prolasioptera berlesiana* Paoli occur in olive groves at the same time when the olive fly (*Dacus oleae* Rossi) begins to lay its eggs in the olives of the year, namely, at the end of June or the beginning of July according to latitude and altitude. Near Pisciotta in the Province of Salerno, in general, eggs may be found in the olives of early varieties at the end of June.

The females of this gnat seek out olives which already contain a *Dacus* egg and in the same puncture which the fly used, lay their egg against the front of that of the *Dacus*. Sometimes two *Prolasioptera* eggs can be found with the *Dacus* egg and sometimes, though very rarely, three *Prolasioptera* eggs. The egg hatches in about 24 hours, practically less than half the time required for the *Dacus* egg to hatch. In olives infested by *Dacus* from July 25 at 5.30 p. m. to July 26 at 5 p. m., newly hatched larvae of *Prolasioptera* could be seen on July 27 at 3 p. m., while the first *Dacus* larvae were only found on the morning of the 28th at 8 a. m., and some were still in the chorion at 10 a. m. of the same day.

The newly hatched larva of *Prolasioptera* attaches itself to the *Dacus* egg, punctures it and sucks at it with such force that it gradually diminishes in volume, becomes flaccid and shrivels up. When at the end of 4 or 5 days, the *Prolasioptera* larva is 1-1.5 mm. long, all that is left of the *Dacus* egg is the more or less irregularly shriveled shell containing a slight trace of yolk, while on examining it through a microscope, the surface is seen to be overrun by a mycelial growth of *Phoma dalmatica* (Thüm.) Sacc. extending its filaments also to the tissues of the egg cavity. The *Prolasioptera* larva develops fully in 8 to 10 days and leaves the olive by the tunnel made by the *Dacus*; it hides in the ground, forms a very thin parchment cocoon, changes into pupa and at the end of 4 or 5 days comes out fully grown. In olives infested by *Dacus* and *Prolasioptera* eggs from July 23 to 26, the adults made their appearance from August 3 to 8.

Examination of sound *Dacus* eggs still containing the living fully developed larva or of the chorion after exit of the larva, shows them to be free from mycelium. There is no doubt then that it was the female of *Prolasioptera* which de-

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* Communication from Prof. F. SILVESTRI, Director of the Royal Laboratory of Agricultural Entomology, Portici, Italy.

posited at the same time as her egg also *Phoma* spores, or else it was the newly hatched *Prolasioptera* larva which carried them in its salivary glands, or in the lower intestine or in the Malpighi tubes and which may consequently through the saliva or excrement infect the *Dacus* egg *.

The fungus, which begins to develop on the vitellin substance which the *Prolasioptera* larva has brought out, then attacks the sarcocarp tissue which surrounds the egg chamber; this sarcocarp begins to lose its natural consistency and its green colour and softens to the extent of becoming gelatinous and deep brick red or beige or oily brown in colour. On the surface of the olive, the characteristic mark of the *Dacus* puncture gradually enlarges and at first extends irregularly afterwards assuming a subcirculer contour of a diameter of 3 to 3.5 mm., is slightly flattened in comparison with the rest of the olive and beige in colour.

Olives of the 'Pisciottana' variety marked with the characteristic scar which ensues after oviposition by the olive fly, destruction of the egg by the larva of the olive gall gnat and the development of *Phoma dalmatica* (full-size).

On removing the skin of the olive when the scar has this dimension, underneath will be seen a funnel-shaped cavity which extends into the olive for a length of 15 mm. and a width of 10 mm. up to the stone. The inner wall irregularly disaggregated is invaded by a dense mycelial growth which sometimes forms almost a felt on the lower part where the 1.80–2 mm. long *Prolasioptera* larva is found. The marking of the olive and the development indicated of the gnat take place within about 5 days. The surface blemish subsequently spreads out to 7 × 5-6 mm. in size (see figure); it turns blackish, the surface concave, the epidermis wrinkled and partly adhering, while the olive dries up onto the stone. On the hind part of the tunnel bored by the olive fly, the epidermis of the olive always keeps, over a very narrow area, a biscuit-umber colour. The zone maculated by the gnat at the end of July (or before) has a more or less irregularly oval contour, 5 × 4 mm. or even larger, up to 7 × 6 mm., as I have already said, and bordered on the green part by an excrescence which, in small olives, may rise slightly above the level of the rest of the surface. In a few of the olives

* This will be determined by further studies.

attacked the sarcocarp on contact with the excrescence of the affected zone may assume a chestnut colour over more than half the olive.

The *Prolasioptera* larva grows inside the changed sarcocarp and comes out of the tunnel bored by the olive fly and falls to the ground. It tries to hide itself as well as it can, weaves a cocoon and within 7 or 9 days turns into an adult insect (on July 26, at Pisciotta, adult gnats came out of cocoons formed on the 18th of the same month; in 1942, cocoons formed on July 24 to 25 produced adult insects on July 30).

The affected part of the olive becomes blackish, shrivels and the fruit loses its adherence at the base of the peduncle and falls.

The adult *Prolasioptera* are very active, they fly and even run rapidly, folding their wings on top of their bodies; kept in closed tubes with honey, they only live a few days (in 1931, from August 10 to 17).

The exact number of generations of this species of *Prolasioptera* has not yet been determined, but certainly there are at least 3 or 4.

Full-grown insects were obtained, at Pisciotta, from the first half of July up to the first ten days in October, always in decreasing numbers. Up to the present the last date observed was October 10 when in two still green Pisciotta olives, I found in each, with a *Dacus* egg, a small *Prolasioptera* larva.

It is probable that from the autumn of one year up to the spring of the following year, this gnat lives on other wild plants which grow in or near olive groves, as at the Laboratory of Agricultural Entomology of Portici, we have never seen olives infested from November to May. This important point will be studied when the whole annual cycle of this species has been determined; thus we will be able to see if it is possible to make it appear at the beginning of summer in olive groves and in sufficient numbers to destroy the *Dacus* eggs. It is true that the olive in which the gnat develops is lost because it falls to the ground while still unripe, but the *Dacus* egg is also destroyed. This is a great advantage since a *Dacus* female of the 1st generation could produce a very numerous progeny.

The following details will give some idea of the intensity of attack by this gnat.

On August 4, 1945 in the commune of Pisciotta, Ficaiola region, all the olives fallen to the ground from an averaged sized tree of the Pisciottana variety (foliage about 8 metres high and 7 in diameter) were collected; it was found that 262 of these olives had fallen as a result of *Prolasioptera* attack and 662 for some unknown reason. The same day in the Piano Mare district, under a tree of approximately the same size and variety, 932 olives attacked by *Dacus* and the olive gall gnat and 662 fallen for an unknown cause were collected.

The morning of August 5, under a very large olive tree of the Pisciottana variety, all the olives which had fallen within an area of about ¼ of the ground below the crown of the tree were collected. It was found that 2336 had fallen through the olive gall gnat and 755 for some unknown cause. The morning of August 6, on the same area, 195 olives fallen because of this insect were collected as against only 4 for unknown reasons. On the same olive tree, a large number

of olives could still be seen with the characteristic mark formed by the deposition of the *Dacus* egg and the development of *Prolasioptera* and *Phoma dalmatica*.

The percentage of olives attacked by *Dacus* and of that by the olive gall gnat can vary appreciably ; thus, in 1931, at the end of July, near Pisciotta, it amounted to approximately 43 per cent.; in 1933, at the same period, it was 9 per cent.; in 1942, July 19 all the olives of a tree in the Noce district were attacked by *Dacus* and the eggs in turn were attacked by the olive gall gnat to the extent of 90 per cent. On July 3, 1943, out of 1061 olives of a tree in Piano Martino, 11 olives were already marked with the characteristic blemish and the *Prolasioptera* larva was practically fully developed, 15 olives showed the *Dacus* puncture, the egg of which was more or less damaged and the *Prolasioptera* larva was present. The same day, on a tree of the Pisciottana variety in the Noce district, of 1007 olives there were 9 with the already large mark of *Prolasioptera*, 12 with the *Dacus* puncture with 10 carrying the newly hatched larva of the olive gall gnat. On July 22, 1945, the olives of the same tree in the Noce district were all attacked by *Dacus* (some with 2 or 3 punctures) and 18 per cent. of the eggs were, in their turn, attacked by the olive gall gnat. The olives of a tree in Piano Martino were attacked to a large extent by *Dacus* and 40 per cent. of the eggs were attacked by the gnat, while in the olives of the 'Pisciottana commune' variety attacked, on some trees even ⅓, by *Dacus* only 2 per cent. of the eggs were lost, and in most cases there was a sort of gall, hardening of the sarcocarp around the egg chamber, resulting in the destruction of the *Dacus* egg or larva.

Prolasioptera berlesiana certainly exists in all the regions of continental, southern, central and northern Italy, at Cyprus and probably in all other Mediterranean regions, but no definite data are available as apparently this species has been confused with *Asinapta furcifer* Barnes which, on the contrary, is common in Sicily, Corfu and probably still other regions.

In Italy, the olive gall gnat was found in large numbers in the Foggia region, near Cassino and in the olive groves at Pisciotta.

Unfortunately, this species is attacked by two parasitic Hymenoptera : the Chalcidid *Tetrastichus invidus* Silv. sp. n. and a Proctotrupid not yet determined.

SERIOUS DECAY OF PAPAW CAUSED BY A NEMA IN ERITREA *

During the course of observations carried out during a period of over three and a half years (from the beginning of 1942 up to the present) on the parasites of the papaw (*Carica papaya* L.) in Eritrea, it was found that this Passifloraceous plant was practically exempt from insect attack since none of the parasites indicated by investigators as affected the papaw in Florida, Cuba, Hawaii and

* Communication from Prof. GIUSEPPE JANNONE, Chief of the Entomological Section, Department of Agriculture, Asmara, Eritrea.

in some regions of Africa were noted. Its chief enemies, however, are two parasites which do not belong to the Insecta, namely a nema and a mite which seriously damage the root system and the aerial part of the papaya.

In this preliminary note we will give some details on the first-mentioned parasite, reserving a fuller study for a subsequent publication. A brief note will shortly be published on the mite.

After having followed several phases of nema attack on the papaw, in December, 1943, on the suggestion of Dr H. W. BEDFORD, I sent some research material to the Director of the Imperial Bureau of Agricultural Parasitology (Helminthology), St Albans, Herts, England. He kindly undertook to have the parasite specified by Dr T. GOODEY, Principal Scientific Officer of the Institute of Agricultural Parasitology also at St Albans. Dr GOODEY found that it was *Heterodera marioni* (Cornu, 1879) Goodey, 1932, commonly called *H. radicicola* Greeff.

He recalled also that this nema had been investigated by BESSEY in 1911 on the roots of the same host in America, and he also gave some instructions with a view to preventing its spread in new papaw groves. At the same time he sent a pamphlet indicating the control methods against this parasite tried in different parts of the world.

It seems that *H. marioni* has never been cited for the papaw in Eritrea. I was unable, at least here, to find any trace in the limited bibliographical material at my disposal. According to the information I obtained from the Agricultural Bureau of Eritrea, some interest was taken in the question several years ago, but I was unable to learn anything further and I found no mention in the files in the record office as regards plant diseases and pests.

It may be said that at present this parasite is widespread in practically all the zones of the Middle Plateau and the Plain, from about 1700 metres down to low level, in papaw plantations situated on the light, sandy-loamy and permeable soils of slopes and riverain banks of torrents, in the eastern Plain up to the Tabò-Salomona Valley, in the western Plain up to Tessenei, including the Hazamò Plain, the Dorfu Valley, the Aidereso Valley, the Mai Habar Valley, the Keren hollow, etc. No trace was found in the plantations situated at the outside limit of altitude which supports the papaw in Eritrea, that is, in the Adi Ugri zone at about 1,900 metres above sea level.

The nema causes in the root system of the papaw (small, medium and even large sized roots) the formation of subspherical galls varying in size from a peppercorn to a walnut or almond in which the females lay their eggs. Subsequently the tissues of these galls blacken and disintegrate causing extensive and deep cankers especially in the tap-root and in the secondary ramifications of the root system which are evidenced by a rot leading to the dying-off of the plants. In the last stage of decay, several other micro-organisms appear also accelerating the end of the affected plants.

The first external symptoms of decay are shown by the yellowing of the leaves; these subsequently lose their vigour and wither; the fruits become wrinkled and coriaceous without completing ripening, while flowering stops definitely.

Not all the plants attacked die. Some, although carrying galls and consequently an appreciable number of parasites, resist their attack, overcoming the crises which the maximum development of the nematode causes during the year, in relation to the favourable environmental conditions and live for a long time, ending by entering into a phase in which they only produce small fruits of poor quality. Nothing remains then but to fell the trees.

The transport of individuals of *H. marioni* from high to low-lying land takes place through streams or irrigation. The parasite is carried to neighbouring or adjacent land through earth-soiled tools and through the passage of man or animals. It also appears that it can shift itself for some distance in the ground in favourable seasons.

Seedlings are certainly the best medium for the transport of the nema even hundreds of kilometres away.

The *Heterodera* in question in Eritrea attacks many cultivated and wild herbaceous plants, particularly, green peas, beans, tomatoes, etc.

A radical method of control always advocated by the Entomological Section of the Department of Agriculture of Eritrea is the felling of the infested plants, their rooting out, burning of all the smaller fragments of roots, disinfection of the holes by means of fire, powdered quicklime, and the suspension of irrigation for a period of 4 or 5 months during the hot and dry season. It is also advisable never to transport seedlings from an infested area to zones still free from the pest, sowing to be effected or nurseries established *in situ*.

Plants infested but still in a good state of production may be treated by cultivating trap-plants round the foot or the tree ; these can be uprooted carefully and burned when loaded with the parasites. It is also advisable to space out irrigation rotation so as to check the growth of the parasite. In order to stimulate vigorous growth namely, a good vegetative condition of the said plants, it is always well to give applications of suitable mineral fertilizers (*e. g.*, calcium cyanamide) which also act directly on the nema by killing it or driving it away from the host plant.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Belgium. — By Decree of the Regent, dated February 6, 1945, measures have been enacted with a view to protecting the production of tested seed and seedlings.

In the regions which it considers suitable for the production of tested seed and seedlings, the General Service of the control of seed and agricultural and horticultural seedlings may prohibit cultivation and compel the eventual destructions of plants which constitute a menace to the maintenance of the soundness and purity of the varieties subjected to its supervision.

When, in the regions as above, the General Service for the control of seed and agricultural and horticultural seedlings subjects to its control the cultivation of seed-bearers, it will be allowed to impose on producers of seed or seedlings special

measures which might be required in order to protect the soundness and purity of the tested seed and seedlings.

The General Service for the control of seed and agricultural and horticultural seedlings notifies the burgomasters of the communes concerned the name and address of the producers whose crops are subjected to its control and have to be protected.

It informs them at the same time of the measures to be taken in order to protect these crops.

Without prejudicing the rights of the officers of the legal police, the powers attributed them and the probative power of their official reports according to the laws and regulations in force, the directors of State Research Stations for plant improvement and their deputy directors, the officers of the General Service for the control of seed and agricultural and horticultural seedlings, State agronomists, State horticultural advisers, officers of the special phytopathological Service and the inspectors for trade in seed, all kinds of seedlings, fertilizers and material for stockfeeds, are especially nominated for finding out and verifying infractions of this Decree. (*Moniteur belge*, Bruxelles, 18 mars 1945, 115e année, nº 77, p. 1570-1571).

*** A Decree of March 17, 1945 commissions the State Phytopharmaceutical Section at Gembloux with analyzing any fungicides, insecticides, weedicides and parasiticides, which concern phytopharmaceutics, intended for preventing and checking the development of animals or plants harmful to crops. (*Ibid.*, 26 mai 1945, nº 146, p. 3343).

*** By Ministerial Decree of March 28, 1945 establishing measures to prevent the spread of the Colorado beetle (*Leptinotarsa decemlineata*), any proprietor, lessee, tenant, occupier, of whatever status, who finds on the land he occupies, whatever the crop cultivated, the presence of the Colorado beetle in the form of the full-grown insect, egg, larva or nymph, is obliged to see to the destruction of same immediately.

In default of effective destruction methods being used by those concerned or when these methods prove inadequate, the burgomaster may officially proceed to the destruction of the Colorado beetle in the territory of his commune.

The same authorization is given the governor, either for the entire province or for the part he indicates.

Preventive and control treatments may be ordered by the Minister of Agriculture or by his deputy as well as by provincial governors, and at the time and place determined.

The use of certain products or certain methods of treatment may be prohibited, regulated or prescribed, either through ministerial instructions or circulars, or by notices, directives or circulars emanated by the special phytopathological Service.

In the regions where horticultural crops are grown for export, all potato fields situated within a radius of 10 km. from horticultural enterprises have to

be adequately treated with lead or calcium arsenate, at least twice a year, or else by contact poisons, such as rotenone, at least three times a year.

The provincial governors are charged with the execution of this provision.

Barring permission granted by the special phytopathological Service, the cultivation of potatoes, tomatoes, and egg-plants is prohibited in horticultural enterprises where plants are grown for export.

This interdiction may be extended to other plants.

Inspection certificate is refused to or withdrawn from the cultivator who does not comply with this provision.

It is prohibited, at all times, to transport or to keep, in any manner whatsoever, live Colorado beetles.

Derogation of these provisions may be accorded, notably for scientific purposes.

The officers commissioned with supervising the execution of this Decree may inspect, between sunrise and sunset, all cultivated areas where they judge their presence necessary with a view to the control of the Colorado beetle.

Infractions of the provisions of this Decree will be punished in conformity with the provisions of articles 5, 6 and 7 of the Law dated December 30, 1882 on the sanitary police control of domestic animals.

Without prejudicing the rights of the officers of the legal police and the probative power of their official reports, the inspectors, assistant inspectors and the officers of the special phytopathological Service, the State agronomists and horticultural advisers, are invested with the authority to find out, throughout the country, and to establish, by official reports attesting the fact until proved otherwise, the infractions of the provisions of this Decree.

These reports will be transmitted, within three days, to the King's Prosecutor.

The assistant experts of the special phytopathological Service are also authorized to draw up reports under the conditions noted above, but they can only take their reports to court after having submitted them to the officer to whom they are subordinate.

The Ministerial Decrees of September 21, 1930, July 26, 1938 and August 11, 1939 [see this *Bulletin* 1938, No. 10, p. 219 and 1939, No. 12, p. 294] are rescinded. (*Ibid.*, 23-24 avril 1945, nos 113-114, p. 2576-2577).

*** A Decree of May 1, 1945 authorizes the capture of sparrows by means of the draw-net called 'tirasse' up to September 15 inclusive. (*Ibid.*, 27 mai 1945, no 147, p. 3379).

Italy. — By Ministerial Decree dated April 30, 1945 the Royal Observatory for plant diseases for Calabria has been established anew at Catanzaro. The area of this Observatory comprises the provinces of Reggio Calabria, Cosenza and Catanzaro. The Ministerial Decree of September 30, 1935 [see this *Bulletin* 1935, No. 11, p. 254] has been repealed. (*Gazzetta Ufficiale del Regno d'Italia*, Roma, 8 settembre 1945, anno 86°, n. 108, p. 1314).

MATERIAL FOR AN EUROPEAN COLORADO BEETLE BIBLIOGRAPHY *

The Colorado beetle (*Leptinotarsa decemlineata* Say) undoubtedly constitutes a permanent menace to the countries of Europe as yet exempt from this pest.

If any of these countries were to be attacked by this beetle, there would evidently be every advantage in benefiting by the experience obtained on the question by nations of the same continent already invaded for what is now a long series of years.

It is with this view in end that it is desired to place at the disposal of the investigators and technicians of the countries concerned this preliminary bibliographical attempt grouping the titles of 349 publications which have appeared on the subject. The consultation of these will enable, if necessary, not only information to be obtained on the historical precedents of the question, but also on the biological and physiological peculiarities of the parasite, as well as on the most practical and effective means of control.

It may be added that the bibliographical index given below does not in any way pretend to be complete : it only registers in effect the publications the original of which has been read.

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* Assembled by GIULIO TRINCHIERI, International Institute of Agriculture.

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